
APPENDIX C

BIOLOGICAL RESOURCES APPENDIX

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APPENDIX C.1

VEGETATION AND RARE PLANT SURVEY REPORT

Vegetation and Rare Plant Survey Report

DWR Tehachapi East Afterbay Project

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1. SUMMARY

Botanical field surveys were conducted on the sixth of April and on 19-20 May of 2004, on the site proposed for the northeast alternative of the California Department of Water Resources Tehachapi afterbay enlargement project. The site that was surveyed is located on the lower southwestern flank of the Tehachapi Mountains at the west end of the Antelope Valley (Photo 1). The study area is on a flat terraced landform northeast of the existing afterbay. The total area of botanical survey was approximately 500 acres including and surrounding the proposed reservoir and spoil pile sites (Spoil #1 and Spoil #2), with more detail and emphasis on the immediate project area.

The survey indicated that the vegetation in the area of the proposed project site was primarily successional, composed of exotic herbaceous plants, scattered native annuals and successional stands of rabbitbrush (*Chrysothamnus nauseosus*) (Photo 2). Vegetation beyond the proposed project site was similar to the east and southeast, but was increasingly variable to the north and to the west of the proposed project site. A list of observed plant species is provided at the end of this report in Attachment 1. Dry erosion drainages fringe the terraced flat. Rainfall was lower than average in this region for 2004. As a result, some annual plants and geophytes that are present, were probably undetected by the survey.

The northeast alternative site supports relatively low vegetation resource quality, with weedy or successional plant associations exclusively. A long history of grazing and dry farming has altered the site into a vegetation type conversion. One rare plant taxa (*Microseris sylvatica*, CNPS List 4) was identified from a minor population during the survey. Our surveys suggest that there may be other rare plants that occur as scattered individuals that went undetected due to the low rainfall of 2004. It appears unlikely however, that any significant population of a listed sensitive plant could be present at the proposed site given the current vegetation condition.

2. METHODS

The surveys were conducted from 10:00 to 17:00 hours, on 06 April, of 2004, from 10:00 to 17:00 hours on 19 May, and from 08:00 to 16:00 hours on 20 May, by Dave Silverman and Cindy Hopkins, biologists with Xeric Specialties Consulting of Ridgecrest, CA. The early portion of the survey on this 06 April and 19 May were conducted/coordinated with various biologists from Aspen Environmental Group, DWR, DFG, and an escort from Impact Sciences Corp. Our primary goals were to identify any rare plants present, assess the habitat for the potential of other unobserved rare plants to occur, create a complete floral inventory and identify the vegetation types present. These goals generally follow the botanical survey guidelines of the California Native Plant Society (CNPS 2001). The specific methods of the guidelines were implemented opportunistically and for the most part, are the methods typical of what most botanical surveyors attempt to accomplish, but were not met to completion of all guidelines suggested. Most importantly, multiple seasons of surveys were not completed to compensate for the lower than average rainfall in 2004, which might result in some annual plants and geophytes being absent from the species list.

We identified in the field, approximately 95 percent of the observable vascular plant taxa of the site for the purposes of rare plant detection and producing a floral inventory. Plants not identified in the field were collected and keyed to regional floras.

The site was sample-surveyed by walking loose meandering transects oriented to observe a variety of physiognomic and soil conditions. Vegetation beyond the proposed footprint of the project was sample-surveyed by walking long meandering transects and driving available dirt roads. Limited mapping of vegetation association boundaries was accomplished with field notes, topographic maps and digital

photographs, backed by selected sub-meter GPS measurements. These data were used to create maps and geo-referenced GIS vegetation layer data. Published plant community types were not utilized in describing the vegetation associations due to inapplicability, because they are primarily based on climax woody plant communities. The vegetation of the project site and the surrounding area was mostly herbaceous covers or of successional condition.

Habitat observations, research of geologic information/rare plant records and our previous experience in the region were used for analysis of potentially occurring rare plants.

3. VEGETATION IN THE SURVEY AREA

The general region is botanically diverse, wedged between the desert, the Sierra Nevada, the Great Central Valley and the Transverse Ranges. Though varied floristic influences exist near the project site, the pre-human vegetation type was probably most characteristic of the arid grassy foothills of the southern San Joaquin Valley. A fiddleneck variety present at the site (*Amsinckia menziesii* var. *menziesii*) is more characteristic of the San Joaquin Valley and probably reaches the southern limit of its range in the vicinity of the project area. The site is now altered and disturbed, and the plant composition is now most referable to the disturbed, successional vegetation associations of the southern San Joaquin and the Antelope Valleys.

Most of the site is located on a terraced flat that has a clayey to sandy loam soil. The flats on this terrace appear to have been plowed and dry farmed previously, which severely affects the soil and vegetation. By contrast, the terraced land just to the north of the section line fence was noticeably more diverse; grasses, forbs, insects, wildflowers, all healthier, even though the two areas look similar at a glance. Terraced landforms such as these are some of the most endangered ecosystems in the west, because they are always some of the first sites to be used by humans. Because of their formation from ancient alluvial systems, they support soil and hydrological conditions such as clay lenses and vernal pools, upon which some of the rarer and more highly adapted plants and animals are dependent. From a conservation standpoint, terraces that have not been plowed (e.g., the terraces north of the NE alternative reservoir site and those to the west of the S alternative) should be given priority over those that have. If preserved, the plowed sites would eventually return to provide ecological function, but some terrace soils never recover the stability and stratification of the upper soils in geologic time.

The southern end of the site, near the south edge of the proposed spoil pile (Spoil #1), slopes into a broad alluvial floodpath where soils are sandier than up on the terraced flats. The broad alluvial floodpath is a very low angle drainage path without channels or obvious watercourses. It is defined by the sandy soils and alluvial fill, more than the vegetation or geomorphology. The south edge of the terrace is marked by a smooth slope (Photo 3) with erosion cut drainages at various intervals (Photo 4).

A natural drainage with a tapped spring and earthen dam flows southward from low foothills to the north of the site (Photos 14 and 15), between the existing afterbay and the proposed northeast alternative reservoir, such that connecting infrastructure will necessarily cross the drainage. The vegetation and faunal resources associated with the drainage are greatly reduced where the drainage enters the project footprint because an earthen dam traps surface water to the north of the project. Cattle activity is intensive in the drainage, and the soils have been altered into a nearly abiotic condition in comparison to intact soil-biota relationships of drainages in the region with similar topography and hydrology.

North of the proposed project site, the terrain gently slopes up into low foothills divided by shallow drainage paths. The vegetation is much more intact, apparently avoided by plowing. Native grasses and wildflowers are more frequent in this area (Photos 1 and 10). Further beyond, to the northeast and northwest are the broad sandy washes of Big and Little Sycamore Canyons. Farther up the slopes, the

foothills of the Tehachapi mountains support blue oak woodland, more grassland, scrubs and a series of faulted terraces with seeps and clay lens deposits.

In general, all of the project footprint area is a successional, degraded or disturbed climax vegetation type.

4. MAPPED VEGETATION UNITS

Vegetation at the site (Figure 1) was mapped mostly at the association level, with a few series types and several weakly differentiated types. All the vegetation present in the project area, as a whole, is primarily disturbed plant associations and all the mapped types for this site are basically weed-dominated herbaceous stands with rabbitbrush scrubs. The divisions between the types are subjective and ambiguous if only the dominant covers (exotic annual herbs in most of the associations) are used to type vegetation. They mostly represent various effects on two climax vegetation types (wash scrub and grassland). Beyond the project site (north and west) are vegetation types more typical of climax plant communities and associations. These are described here because they may serve for future planning purposes and they are displayed within the boundaries of the vegetation map.

Herbaceous Succession

“Herbaceous Succession” is mapped for much of the vegetation in the project area, especially the broad flat terraced landform where plowing/dry farming once occurred. Exotic herbs, including filaree (*Erodium cicutarium*), foxtail grasses (*Bromus*, *Hordeum*), and mustard (*Hirschfeldia*), dominate the cover in these areas (Photo 2). Native plants, primarily fiddleneck (*Amsinckia menziesii*), rabbitbrush, sand-aster (*Lessingia filaginifolia*), and goldfields (*Lasthenia californica*) are scattered. In general, this area has been too altered and disturbed for too long to support many native herb species. This mapped vegetation unit is continuous with some of the other types and probably is the most characteristic of the site.

Rabbitbrush Succession

“Rabbitbrush Succession” is mapped for areas where rubber rabbitbrush (*Chrysothamnus nauseosus* var. *hololeucas* and var. *mohavensis*) occur in prominent stands (Photos 7 and 8) among weedy herb covers that are, on average, still the dominant cover despite the shrub frequency. This association is more or less the same as the herbaceous succession type, except that rabbitbrush is more frequent. A few other shrubs are rare in this vegetation type. Native annual plants are scattered (Photo 9) in this type, but a little more frequent than in the open Herbaceous Succession type, perhaps an indicator (along with the rabbitbrush) of more stability and succession.

The abundance and vigor of desert rabbitbrush varieties (var.s *hololeucas*, *ceruminosus*, and *mohavensis*) in this region are associated with climax vegetation in washes and of natural successions following burns and debris flows. The occurrence of rabbitbrush at the proposed project site however, is due to human-induced disturbance regimes and would not typically occur on the landform type of the project site in a natural setting. This distinction is conspicuous where the 28/33 section line fence (at the northern access road proposed for the project) divides the past land use patterns between grazing (section 28) and dry farming/grazing (section 33).

Wash Succession

“Wash Succession” is mapped for the broad sandy channels (Photo 11), erosion cut drainages (Photo 4) and alluvial floodpaths (Photo 3). This vegetation type is defined by sandy soils and intermittent surface/subsurface flow hydrology, rather than by a homogenous vegetation cover. The vegetation is ambiguous for much of these areas, in part due to the current disturbed state. The meandering flow paths, variable surface flows, oscillating water tables and active fill of the drainages are additional local

factors maintaining the associated vegetation in a seral, weedy or successional state. Exotic annual herbs are the dominant covers mostly. The wash succession areas are composed of minor subsets that are associated with terraces, sandy channels, banks and areas of fill, depending on the local effects and past flooding patterns. Calabazilla (*Cucurbita foetidissima*), a geophytic gourd, seems to be curiously characteristic of the type in general, even though it is widely scattered.

In general, scrubs are more varied and frequent in these areas than on the nearby terraces. Rabbitbrush is common as successional stands, and in the upper portions of the wash systems it is also a climax type. A portion of the drainage south of the outlet structure (where the aqueduct turns southeastward at Cottonwood Chute), is perhaps typical of the vegetation that would have more widely existed in the narrower, active sandy channels prior to diversions and alluvial fill (see Photo 11). This area includes dense rabbitbrush, bladderpod (*Isomeris arborea*), fourwing saltbush (*Atriplex canescens*), mulefat (*Baccharis salicifolia*) and tamarisk (*Tamarix* sp.). Perhaps at one time, outlying trees such as Elderberry (*Sambucus mexicana*), willows (*Salix*), and oaks (*Quercus*), were more widely scattered in these drainages prior to changes in hydrology and cattle grazing. Cattle are especially hard on the isolated trees.

In the narrower drainages with alluvial fill, some mesic herbaceous plants, such as creeping wildrye (*Leymus triticoides*) and wire rush are present, perhaps as dense stands in the past in these areas. These areas grade into more mesic drainages and the Dry Meadow vegetation type. The mesic herbaceous plants appear to come and go depending on multi-year weather trends and land use changes.

The banks of the drainages and their transition with the terraced landforms have the most diverse vegetation at the site, supporting a higher density of native annuals and perennials (see description of Photo 11) than in other areas of the site surveyed, but still a plant association that would be dominated by exotic annual herbs if cover and density were measured. In some areas around the project site, the banks of the wash succession areas grade into vegetation typed as Terrace Grassland.

Herbaceous Riparian

The natural drainage that extends north-south between the proposed reservoir site and the existing aqueduct supports a low diversity riparian stand of vegetation (Photo 15) from a tapped spring and is contained to the north of the project footprint by an earthen dam (Photo 14). Water speedwell (*Veronica anagallis-americana*), wire rush (*Juncus balticus*), spike-rush (*Eleocharis*), and water-cress (*Rorippa*) are the dominant covers in this stand. A pond and associated drainage system to the north of the 28/33 section line has similar vegetation and feeds into the drainage associated with the project site. Other areas of this vegetation type are less disturbed and altered and generally have more species present.

Terrace Grassland

This vegetation association weakly occurs in the project footprint, but is dominant on the sloping terraces and foothills to the north (Photo 10) of the 28/33 section line fence and probably was the primary type of vegetation in the project area prior to the plowing of the soil and other human-induced disturbances. Strips of this vegetation type that have not been plowed persist along the edges of the disturbed terrace landforms, mostly associated with the unnamed drainage between the existing afterbay and proposed reservoir site, the southwest edge of the project terrace landform and along the banks of Big and Little Sycamore Canyon washes. The population of Sylvan microseris detected during the surveys is associated with one of these "strips." Nodding needlegrass (*Nasella cernua*), bluegrass (*Poa secunda*) and goldfields (*Lasthenia californica*) were the most conspicuous plants of this association, along with other exotic and native annual grasses and forbs. Rabbitbrush is nearly absent in this association; another indicator of lower disturbance levels.

The cover density of the perennial native grasses in these areas are locally dominant in patches, but dispersed elsewhere within the vegetation unit. Because native perennial bunchgrass grasslands in California are highly degraded, cover dominance of the bunchgrass is no longer considered an absolute defining factor for perennial grassland types. The relative frequency of the grass in comparison to the most intact remaining stands in California is now part of the current criteria. The perennial grasses in this plant association north of the project site are dense enough to be called “native grassland,” under the modern interpretation of the type.

Revegetation efforts associated with the project should attempt to use this association as a performance standard. Revegetation with rabbitbrush and needlegrass would be an easy cover to achieve if revegetation requirements were strict to the point that ecological standards are not feasible and a “native” plant cover standard needs to be achieved.

Foothill Grassland

This vegetation association is located north of the proposed project footprint. It is associated with the steeper slopes of the lower foothills and sharply grades into the Terrace Grassland type. In these areas, the vegetation and soils are more heterogeneous than the Terrace Grassland. The Foothill Grassland appears to alternate with Blue Oak Woodland on the lower slopes, presumably due to soils and hydrology differences between the various slope toes of the Tehachapi range. Clayey deposits, faulted zones, seeps and exposures of decomposed rock strata in the lower foothills provide habitats for a variety of herbaceous communities. Like most other plant associations in the project area, the relative cover is probably dominated by annual grasses and forbs, but there are conspicuous patches of very dense perennial grass stands and occasional sparse stands of shrubs like rabbitbrush, goldenbush (*Ericameria linearifolia*) and bladderpod. Shrubs become denser where the grassland slopes into the major drainages.

The areas of perennial bunchgrasses appear to be associated with the more exposed slopes and ridges with well-draining soils. Perennial herbs are also dense in these areas, particularly fleabane (*Erigeron foliosus*), sand-aster (*Lessingia filaginifolia*) and golden-aster (*Heterotheca sessiliflora*). Sylvan microseris (CNPS List 4) was also associated with these areas where soils were more exposed.

Clayey deposits and seeps occur within the Foothill Grassland units. Many of these areas appear to be associated with a series of foothill faults at the base of the Tehachapi range in this area. These areas were mapped as Herbaceous Riparian or Dry meadow types to distinguish them as a more mesic vegetation type, but for the most part, they are soil and hydrology effects within the larger areas of grassland and grade completely into the grassland. These areas support several rare plants, including Round-leaf filaree (*Erodium macrophyllum*) and little barley (*Hordeum depressum/intercedens*).

Dry Meadow

This vegetation association probably does not occur in the proposed project footprint as proposed, but borders some of the riparian strips to the north of project. This vegetation is transitional between the Herbaceous Riparian vegetation and several other types, including Foothill or Terrace Grassland and Wash Succession types. It is characterized by vernal soil moisture or weak surface run-offs, loamy soils with increased clays and silts, and a drying season sufficient to exclude obligate riparian plants. Facultative riparian plants such as creeping wildrye, wire rush, narrow-leaf milkweed (*Asclepias fascicularis*), willow dock (*Rumex salicifolius*) and mesic weeds such as barley (*Hordeum murinum*), dock (*Rumex crispus*) and mallow (*Malva parviflora*) are most characteristic of this vegetation type.

Cultivated Trees

This vegetation unit is mapped for areas of planted and cultivated trees. It borders the aqueduct infrastructure and may or may not be affected by the proposed project. These plantings include a wide variety of trees, including cottonwoods, willows, mesquite, ash and fruit trees.

Blue Oak Woodland

This vegetation association does not occur in the project footprint. These areas are mostly well to the north of project area, but come close to the north end of the existing afterbay at the mouth of Alamos Canyon. This vegetation type is well established and fairly homogenous throughout central cismontane California. Typically, blue oak (*Quercus douglasii*) is the only significant woody species, with an understory of herbs and forbs. Exotic grasses, especially wild oats (*Avena* spp.) and ripgut (*Bromus diandrus*), are prominent, and seem to play a role in the fire ecology of the oaks by reducing or eliminating other woody species. Blue oaks and other similar trees are also scattered beyond the woodland into other vegetation types.

Riparian Trees

This vegetation association does not occur in the project footprint, but is closely associated with portions of the aqueduct infrastructure in the area. These area gallery stands of cottonwoods, willows and ash (*Fraxinus latifolia*) are associated with the stream courses of Oso and Alamos canyons.

Upland Succession Scrub

Part of this vegetation association occurs at the southwest edge of the current project area. This is associated with disturbed areas that have a xeric slope and well-draining soil type. Adventive scrubs like California buckwheat (*Eriogonum fasciculatum*) and goldenbush (*Ericameria* spp.) are frequent in this weakly defined type. Yellow pincushion (*Chaenactis glabriscula*) is very characteristic of this vegetation effect.

5. POTENTIALLY OCCURRING RARE PLANTS

One rare plant taxa, Sylvan microseris (*Microseris sylvatica*) was identified from a minor population (Figure 3) of approximately 0.2 acres in extent during the survey. This species is recognized by the CNPS rare plant inventory under List 4, R-E-D code of 1-2-3, State rank of S3.2 and a Global rank of G3. These status rankings are typical of plants that are still numerous enough to not be under threat of extinction, but are restricted or depleted enough to warrant concern. This plant is a geophytic perennial of the composite family that occurs in valley grassland habitats in the lower elevations of its range and into the transition with other woody plant communities at higher elevations. Though widespread in California, it is a state endemic and much of its former habitat has been lost to grazing and agriculture. It was determined to occur on site after species confirmation from mature fruit collected during the second survey period. The population consists of approximately 50 individuals and is approximately ¼ acre in extent. It is located just east of the existing aqueduct on a west-facing drainage bank, more-or-less in the footprint of the flume that will bridge the proposed reservoir to the aqueduct. Typically, a single occurrence of plant species with this status does not affect project planning or have any required mitigation.

One of the plant species detected close to the project, a spike-rush (*Eleocharis* sp.) remains unidentified. It is probably *E. macrostachya*, but is difficult to confirm without herbarium reference work. Only one rare species of spike-rush (*E. parvula*, CNPS List 4) has potential to occur in this area. This species is much smaller than the one detected from our surveys.

The condition of the site suggests that no significant population of a threatened or endangered rare plant would occur, though it is possible that some individuals of a rare species might be detected in a more

vigorous rain year or were missed by our surveys. There are always plants that can occur unexpectedly at any given site. Because of the floristic diversity of the region, there are many rare plant records near to the site. The local habitat type and condition of the site however, is a strong limiting factor. Rare plants that prefer San Joaquin Valley grassland habitats are the most likely status species to be found.

Such a rare species is Round-leaf filaree (*Erodium macrophyllum*) is that is rapidly declining, with the majority of known occurrences extirpated. It is recognized by the CNPS rare plant inventory under List 2, R-E-D code of 2-3-1, State rank of S2.1 and a Global rank of G4. Given its distribution from Oregon to Baja California and presence in most of California's counties, it may be one of the most rapidly declining plants in the west. It is threatened by habitat loss and especially exotic weed type conversion. The greatest concentration of remaining populations is associated with the central coast range. The largest single population known currently however, occurs in the project region and it is distributed throughout the foothills and terraces on the Antelope Valley side of the southwest Tehachapi range. Our surveys detected significant occurrences this plant approximately 1000 meters north of the current project boundary along with major occurrences detected in 2003 to the west of the proposed reservoir site (Figure 4). This plant has a distinct preference for heavy clay soil and no such substrate was observed in the current project area, though some moderately clayey soils are present in the same area as the occurrence of sylvan microseris. An exotic filaree, *Erodium botrys*, seems to replace *E. macrophyllum* in the project region where clay soils are not as dense. Given the dense populations of *Erodium macrophyllum* to the west and north of the site, it may be possible to find sporadic individuals of Round-leaf filaree in the northeast alternative project site in an abundant rainfall year.

Little Barley (*Hordeum intercedens*) is a rare native annual grass that occurs mostly in southern California, but is also known from the southern San Joaquin Valley. It is difficult to distinguish this species from the more common *H. depressum* (also called little barley). Many of the intact seeps and upper drainages in the project region support stands of little barley, some or all which may be *H. intercedens*. This grass probably occurred historically in the narrow drainage that runs through the project area, but it is very sensitive to disturbance and hydrology changes and is unlikely to be present currently, though sporadic individuals may show up after a major channel bottom-altering flood event.

Sagebrush loeflingia (*Loeflingia squarrosa* var. *artemisiarum*) is known from the region by the type collection and probably occurred in the more frequently in the Antelope Valley prior to farming. It still occurs in good populations at the east end of the valley in very sandy Joshua Tree desert. The soils at the site do not have the characteristics preferred by this taxa, and currently will not support these plants to grow in any numbers or reproduce successfully. It may be present as sporadic individuals on sandy wash alluvial terraces though.

When plants have extremely low numbers, are difficult to detect among millions of common species and exist without ongoing reproduction, they become impractical to survey and manage for, and are always an open-ended question for all botanical surveys. Only colorful and conspicuous plants might be detected reliably when in very low numbers, otherwise luck is necessary. Additional surveys in 2005 to find rare plants would be impractical, unless a significant rain season happens. If there were the opportunity to survey the site in a big rainfall year, there might be a few interesting plants detected, maybe some rare ones, but a survey restricted only to the project site as proposed will likely not yield any other botanical resources that would change the planning status of the project. If a more certain assessment is necessary, we recommend a survey that also includes the more intact nearby terrain, to establish presence of rare plants nearby, as these areas would offer a better chance of detection. If some rare taxa are detected in a similar habitat setting, then a repeat rare plant survey of the northeast alternative site with a more focused goal might then be worth the effort.

6. REFERENCES

CNPS 2001. CNPS Botanical Survey Guidelines from CNPS Inventory, 6th Edition 2001. Available online at <http://www.cnps.org/rareplants/inventory/guidelines.htm>

Hickman, James C., Ed. 1993. The Jepson Manual: Higher Plants of California. University of California Press. 1400 pp.

7. FIGURES

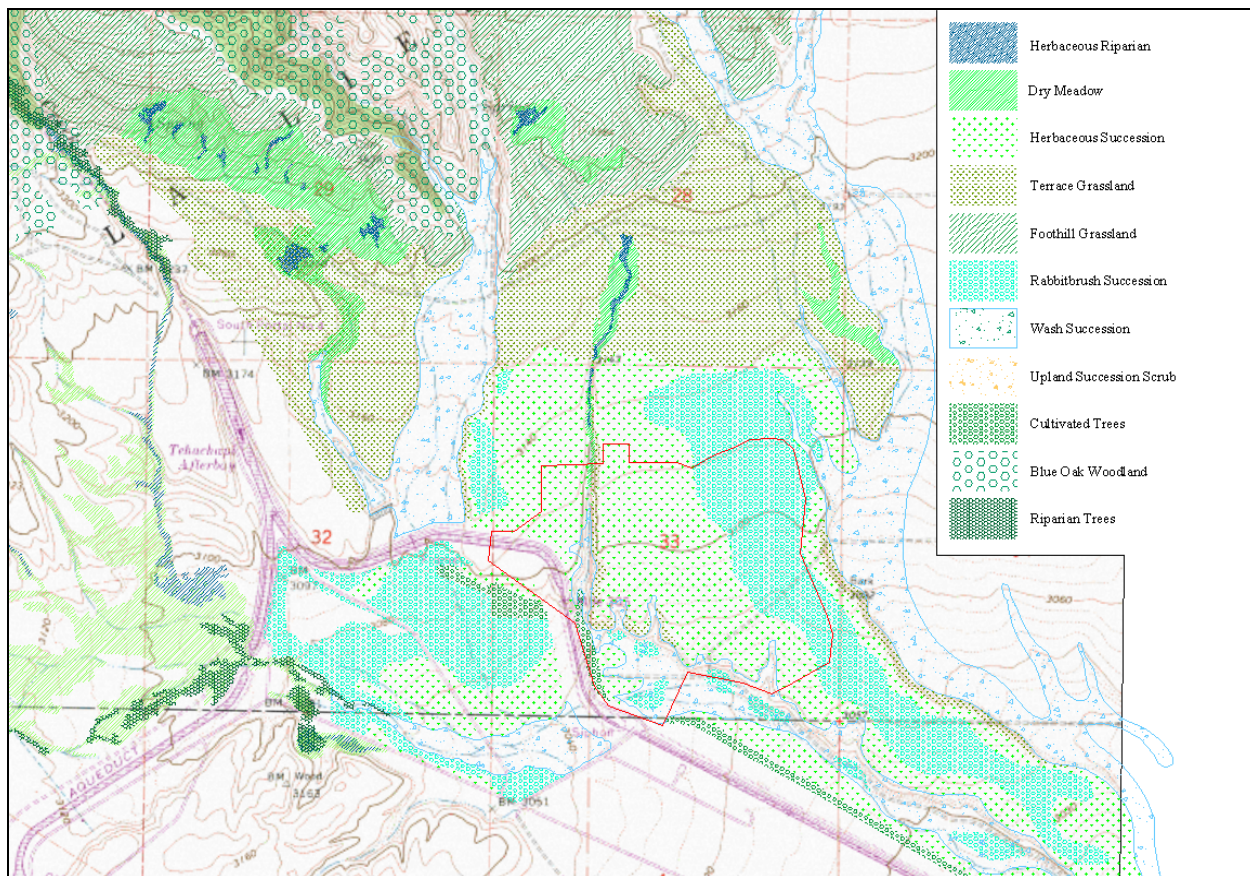


Figure 1. Vegetation map of the proposed Tehachapi East Afterbay site. The red polygon is the approximate outline of the project area, but not all of this area is in the footprint.

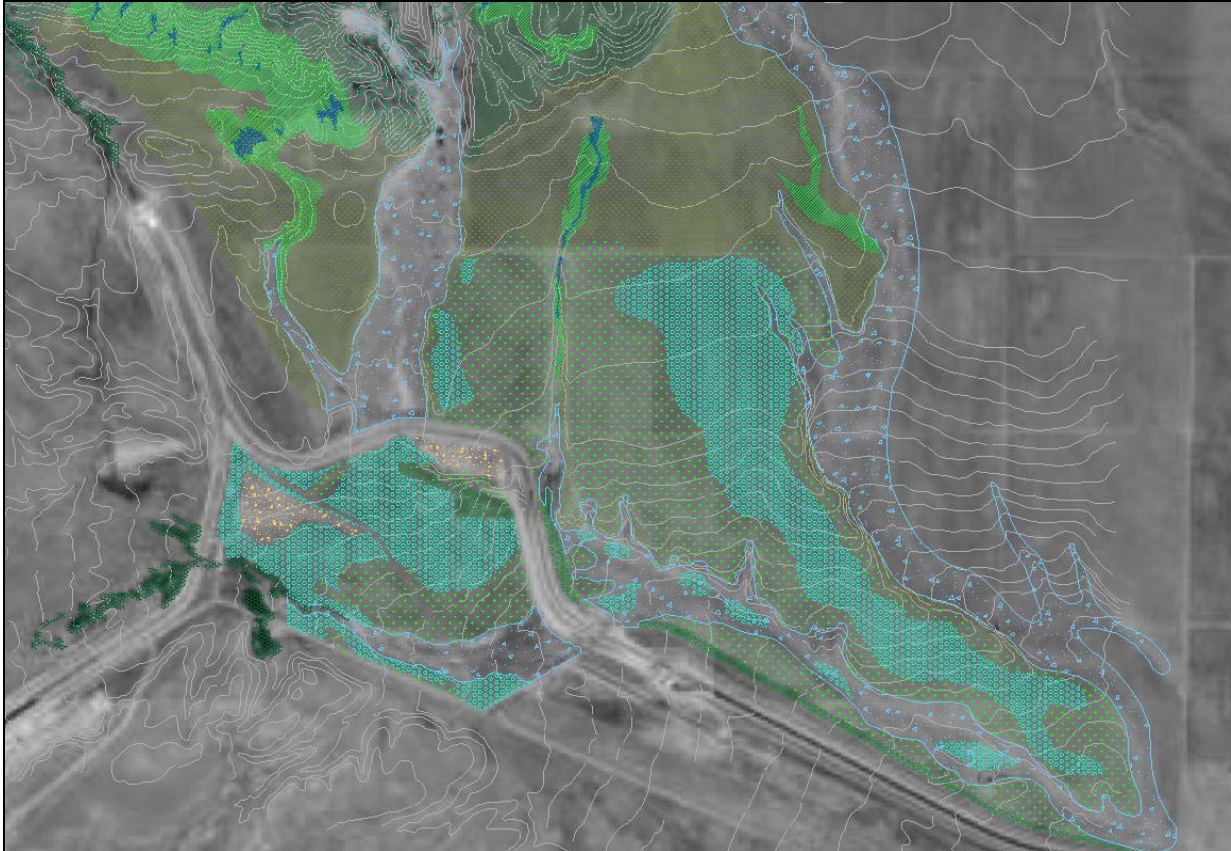


Figure 2. Vegetation map overlaid on a 1994 USGS Terra Server aerial image of the proposed afterbay enlargement site.

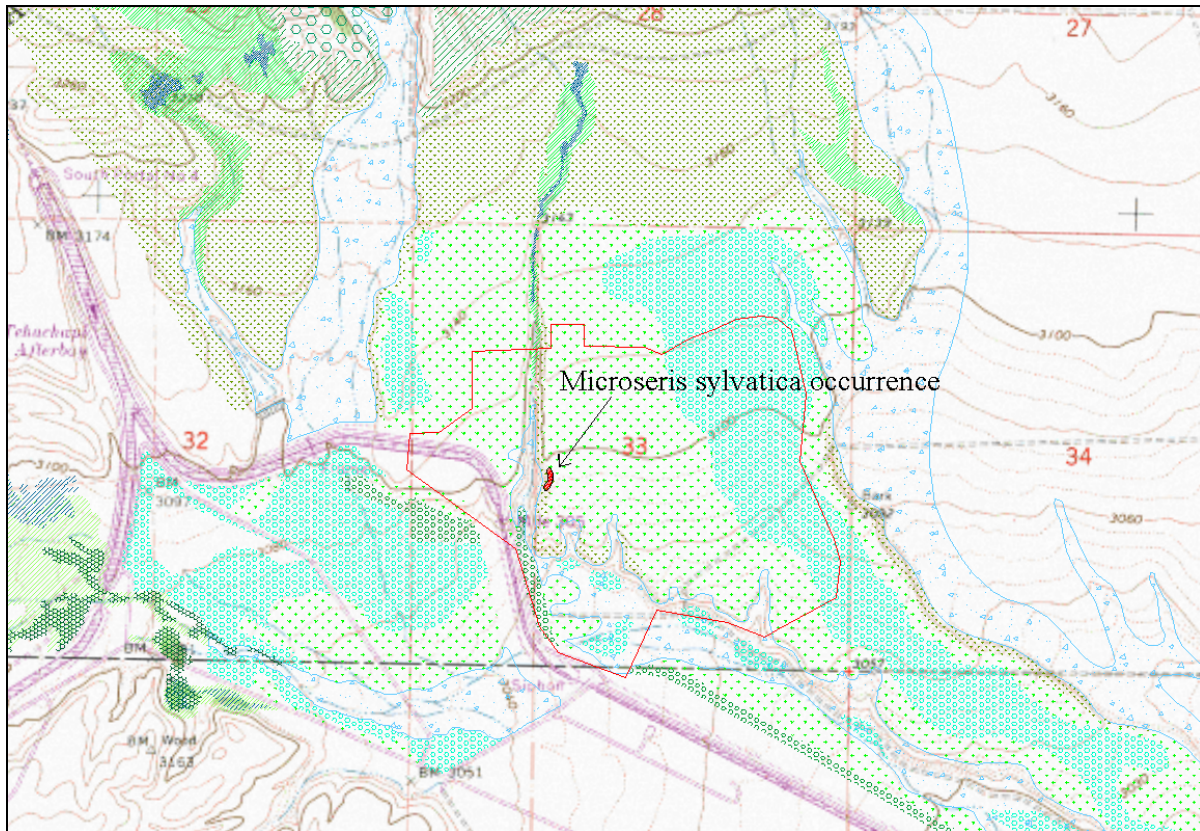


Figure 3. Location of Sylvan microseris within the project area

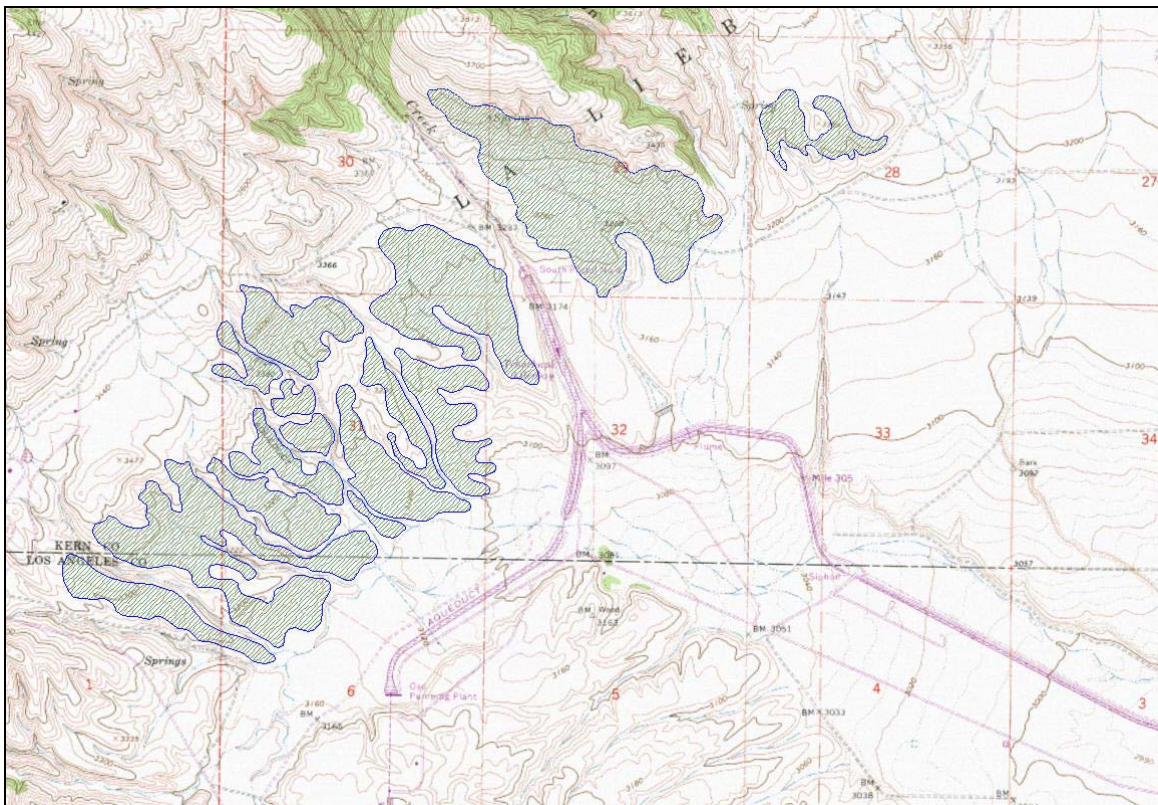


Figure 4. Distribution of round-leaf filaree habitat in the project area

8. VEGETATION PHOTOS FROM 06 APRIL 2004



Photo 1. View of north end of the NE Alternative site (beyond dirt road in picture) from the foothills off-site to the north, looking south, Liebre Mountains in the distance. Yellow colors are mostly goldfields (*Lasthenia californica*), with intensity greater north of the site where there is less disturbance.



Photo 2. Typical site conditions on the terrace flats of the NE Alternative site. Vegetation is successional with rabbit brush (*Chrysothamnus nauseosus* var. *hololeucas*), hoary mustard (*Hirschfeldia incana*, last year's skeletons), cheatgrass (*Bromus tectorum*), and filaree (*Erodium cicutarium*). Other annual plants, both native and exotic, are scattered as the remaining cover. Conditions here are very poor for supporting sensitive plant species.



Photo 3. View of south end of proposed spoil pile (Spoil #1) where flats slope off into the more-sandy channel bottom soils of an alluvial floodpath. Drainages with erosion cuts occur between the toes of the slopes.



Photo 4. Erosion cut drainage at southwest end of proposed spoil pile (Spoil #1) with California poppies (*Eschscholzia californica*), otherwise mostly weedy plants, rabbitbrush and sand-aster (*Lessingia filaginifolia*). Though often identified with native California, the presence of poppies is not a good indicator of habitat quality because of their affinity for disturbed sites.



Photo 7. In the northern part of the site, where the proposed reservoir would be located, the greener *mohavensis* variety of rabbitbrush (*Chrysothamnus nauseosus* var. *mohavensis*) was present in patches. The lighter colored *hololeucas* variety, which is the more native and prominent form in this region, can be seen in the background and in the next photo. This portion of the site seemed to have the best vegetation condition relative to the other areas on-site, but still very when compared to intact sites in the region that have not been so disturbed by grazing and plowing.



Photo 8. The *hololeucas* variety of rabbitbrush (*Chrysothamnus nauseosus* var. *hololeucas*), this patch is concentrated on sandy soils at the mouth of an erosion cut drainage.



Photo 9. Purple owl's clover (*Castilleja exserta*) was frequent in the same areas as the *mohavensis* variety of rabbitbrush, but thinly scattered elsewhere on the site. Goldfields, bicolor lupine and filaree are also in this picture.



Photo 10. Example of Terrace Grassland vegetation type north of the proposed reservoir site, beyond the 28/33 section line fence and into the low foothills. Nodding needlegrass (*Nasella cernua*) and bluegrass (*Poa secunda*) were common with goldfields. The densities were high enough in this area to be classed as a native grassland vegetation type. This grass was much reduced in the proposed alternative site, mostly restricted to the edge of drainages.



Photo 11. Dry drainage east of the northeast bifurcation of the aqueduct. A few riparian trees (red willow, tamarisk and mulefat) are “hanging on”, the soil beneath them “hammered” by cattle into dust. To the left, a cattle fence protects a portion of the drainage where scrubs and small trees still remain; probably the vegetation most similar to what might exist without the disturbance regime. The erosion cuts in the upper left are typical of all the drainages of the flats, but these are the deepest in the project area. The proposed outlet channel is just north of the erosion scars. The drainage is probably drier than pre-ranching conditions due to an earthen dam (see following pictures) further up the drainage, beyond the proposed outlet channel. The drainage slopes in the foreground were probably the most interesting area surveyed in terms of native plants, though still very disturbed. Sylvan Microseris (*Microseris sylvatica*, CNPS List 4) was collected from this slope (Photo 12).

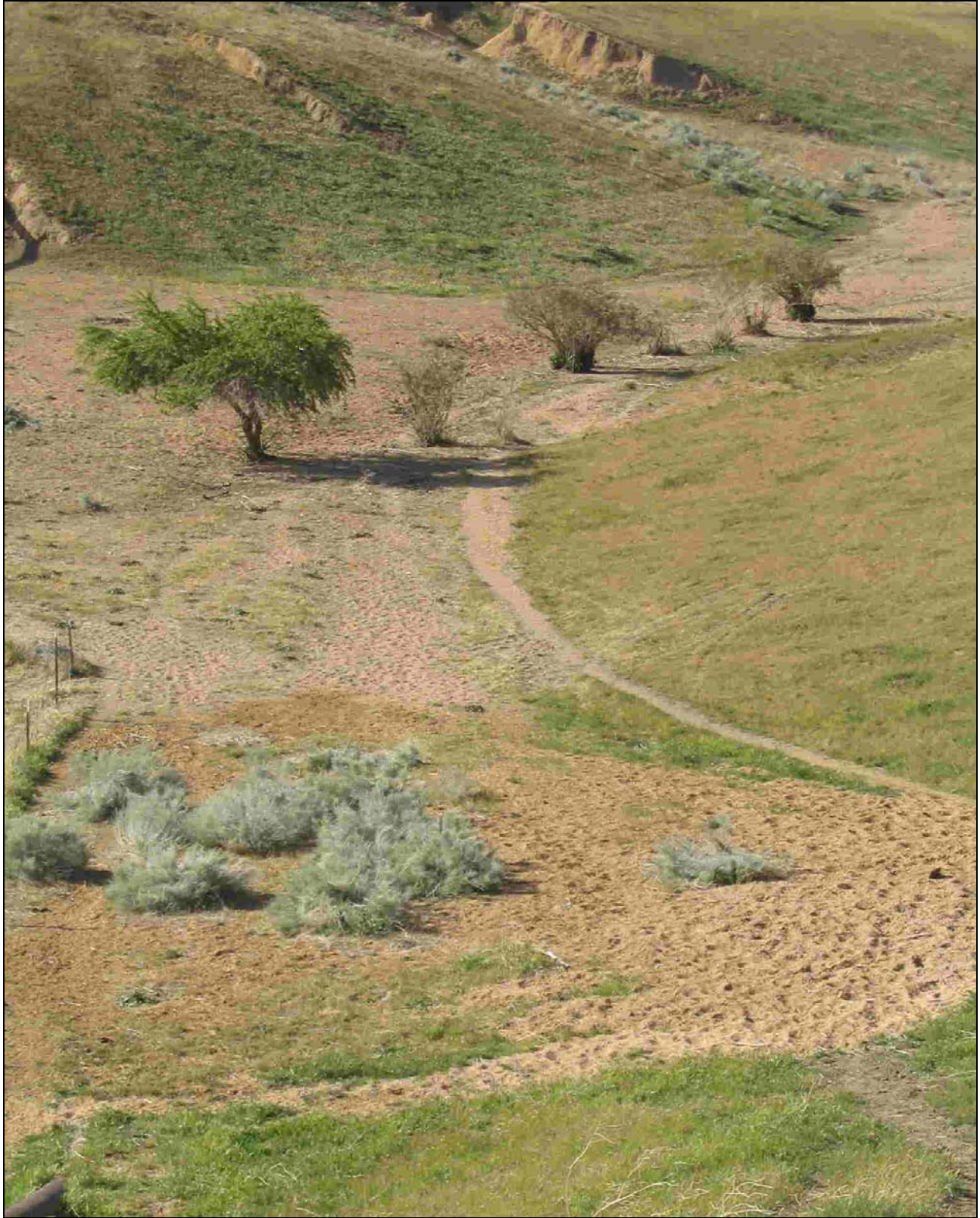


Photo 12. Close-up of the riparian trees in the bottom of the drainage. A small stand of rabbitbrush is in the foreground, with red willow, tamarisk and mulefat, further back.



Photo 13. Collection of sylvan microseris (*Microseris sylvatica*), an uncommon species characteristic of grassland-woodland transition habitats in the San Joaquin Valley. This CNPS list 4 plant was lacking ID after the first survey, but a determination was made after the second site survey, when mature fruits were available for identification.



Photo 14. The earthen dam further up the drainage, north of the proposed outlet channel. This structure retains the surface flows effectively, more or less eliminating the presence of all herbaceous riparian plants below this point.



Photo 15. The riparian drainage contained to the north by the earthen dam. This area is beyond the proposed project footprint and does not seem to have any systemic impacts that would occur from the project alternative as proposed. The surface water that feeds this near-seasonal stream is feed by a tapped pipe in the foothill drainages to the north. The overflow pipe at the bottom of the picture appears not to have bypassed water through the dam in a long time. A low diversity riparian plant community, primarily composed of wire rush (*Juncus balticus*), spike-rush (*Eleocharis* sp.), and water speedwell (*Veronica anagallis-americana*), runs for approximately 500 meters with the surface flow. Western toad larvae (*Bufo boreas*) were present in the stream.

ATTACHMENT 1 TO APPENDIX C.1

VASCULAR PLANT LIST

ATTACHMENT 1 TO APPENDIX C.1

Vascular Plant List for DWR Tehachapi East Afterbay Project

Scientific names mostly follow The Jepson Manual, (Hickman, 1993) **On-site plants are in bold text**
 Comments are specific to site surveys on 6 April and 19-20 May 2004 * = exotic or non-native plant taxon

Scientific Name	Common Name	Comments
GYMNOSPERMS		
CUPRESSACEAE	Cypress Family	
<i>Juniperus californicus</i>	California juniper	native, low tree, uncommon in foothills N of site
ANGIOSPERMS - DICOTS		
AMARANTHACEAE	Amaranth Family	
<i>Amaranthus blitoides</i>	Prostrate pigweed	native, annual, occasional in drainage, frequent around cattle ponds
APIACEAE	Parsley Family	
<i>Lomatium utriculatum</i>	Common lomatium	native, perennial geophyte, dry drainage, uncommon on banks, very common further to the north and west of the project site
APOCYNACEAE	Dogbane Family	
<i>Asclepias fascicularis</i>	Narrow-leaf milkweed	native, perennial, rare in the project area, in drainages
ASTERACEAE	Composite Family	
<i>Achyraea mollis</i>	Blow wives	native, annual, occasional in heavy clay deposits north of site
<i>Baccharis salicifolia</i>	Mulefat	native, tall willowy shrub, dry lower drainage, rare, two tall shrubs
<i>Chaenactis glabriscula</i> var. <i>glabriscula</i>	Yellow pincushion	native, annual, occasional on edges of drainage cuts
<i>Chamomilla suaveolens</i>*	Chamomille	exotic, annual, occasional in drainage and muddy flat openings, frequent around cattle ponds
<i>Chrysothamnus nauseosus</i> ssp. <i>hololeucas</i>	Rubber rabbitbrush	native, shrub, common throughout site
<i>Chrysothamnus nauseosus</i> ssp. <i>mohavensis</i>	Rubber rabbitbrush	native, shrub, occasional at north end of site
<i>Ericameria linearifolia</i>	Showy goldenbush	native, shrub, rare, scattered around the site
<i>Erigeron foliosus</i> var. <i>foliosus</i>	Fleabane	herbaceous perennial, occasional throughout site, mostly along the edge of drainages
<i>Helianthus annuus</i>	Sunflower	native, annual, uncommon , in drainages and weedy areas
<i>Heterotheca sessiliflora</i> (ssp. <i>sessiliflora</i>?)	Golden aster	native, biennial, uncommon on banks of drainage
<i>Lasthenia californica</i>	Goldfields	native, annual, well distributed about site, but not in characteristic dense cover patches
<i>Lessingia filaginifolia</i> var. <i>filaginifolia</i>	California aster	native, perennial, frequent throughout site, especially on roadsides
<i>Madia elegans</i>	Tarweed	native, annual, rare on-site, more common in grassy foothills to north
<i>Microseris douglasii</i>	microseris	native, annual, occasional in heavy clay deposits north of site
<i>Microseris sylvatica</i>	Sylvan microseris	native, perennial geophyte, uncommon, along edge of drainage east of aqueduct, CNPS List 4

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<i>Monolopia lanceolata</i>	Hilltop daisy	native, annual, occasional, scattered around the site
<i>Senecio flaccidus</i>	Wash groundsel	native, subshrub, uncommon, mostly in drainages
<i>Stephanomeria exigua</i>	Annual mitra	native, annual, uncommon, mostly in sandy areas in drainages
<i>Stephanomeria pauciflora</i>	Wire-lettuce	native, subshrub, uncommon, scattered about the site
<i>Stephanomeria virgata</i>	Mitra	native, biennial, uncommon, N of site, scattered along wash banks and foothills
<i>Uropappus lindleyi</i>	Silver puffs	native, annual, well distributed throughout the site, but generally uncommon
<i>Xanthium spinosum</i> *	Spiny cocklebur	exotic, annual, at cattle pond north of section line fence
BORAGINACEAE	Borage Family	
<i>Amsinckia menziesii</i> var. <i>menziesii</i>	Rancher's fireweed	native, annual, well distributed throughout the site, but not abundant
<i>Amsinckia tessellata</i>	Devil's lettuce	native, annual, scattered, uncommon
<i>Cryptantha pterocarya</i> var. <i>pterocarya</i>	Wing-nut cryptantha	native, annual, uncommon, sandy alluvial terraces of Big and Little Sycamore Cyn washes
<i>Heliotropium curassavicum</i>	Salt Heliotrope	native, perennial, uncommon, seep in upper drainage
<i>Plagiobothrys arizonicus</i>	Arizona popcornflower	native, annual, frequent, but not numerous
<i>Pectocarya penicillata</i>	Comb-bur	native, annual, uncommon, mostly on banks of drainages
BRASSICACEAE	Mustard Family	
<i>Descurainia sophia</i>*	Tansy mustard	exotic, annual, a few weedy patches scattered in openings
<i>Hirschfeldia incana</i>*	Hoary mustard	exotic, biennial, abundant throughout the site, skeletons indicated high production in the previous year
<i>Lepidium latifolium</i>*	Perennial peppergrass	exotic, perennial, seep in upper drainage, rare, only at pond at top drainage
<i>Lepidium nitidum</i>	Shining peppergrass	native, annual, common on terraces and foothills, probably occurs in project area
<i>Rorippa nasturium-aquatica</i>	Water cress	native, perennial, in wet portion of the drainage
<i>Sisymbrium irio</i>*	London rocket	exotic, annual, occasional throughout the site
<i>Tropidocarpum gracile</i>	Keel-fruit	native, annual, frequent, but not numerous, on flats throughout the site
CAPPARACEAE	Caper Family	
<i>Isomeris arborea</i> var. <i>globosa</i>	Bladderpod	native, shrub, uncommon, mostly associated with disturbed/revegetation areas along aqueduct in project area, common as native stands in the foothills and washes off-site
CAPRIFOLIACEAE	Honeysuckle Family	
<i>Sambucus mexicana</i>	Blue elderberry	native, small tree, uncommon, scattered in washes and canyons
CHENOPODIACEAE	Goosefoot Family	
<i>Atriplex canescens</i> ssp. <i>canescens</i>	Four-wing saltbush	native, shrub, dry drainage, uncommon
<i>Salsola tragus</i>	Russian thistle	exotic, annual, frequent in the dry drainages, less common on the flats

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CONVOLVULACEAE	Morning Glory Family	
<i>Calystegia malacophylla</i>	Morning glory	native, perennial vine, rare, on banks of drainage, more common in foothills to the north
CUCURBITACEAE	Cucumber Family	
<i>Cucurbita foetidissima</i>	Wild cucumber	native, perennial vine, rare, on banks of drainage
EUPHORBIACEAE	Spurge Family	
<i>Eremocarpus setigerus</i>	Turkey mullein	native, annual, frequent, scattered throughout the site
<i>Euphorbia (Chamaesyce) albomarginata</i>	Rattlesnake weed	native, perennial, occasional, scattered throughout the site
FABACEAE	Legume Family	
<i>Astragalus douglasii</i> var. <i>douglasii</i>	Douglas milk-vetch	native, perennial, uncommon, on roadsides
<i>Astragalus purshii</i> var. <i>tinctus</i>	Wooly-pod milk-vetch	native, perennial, uncommon, off-site to north in terrace foothills
<i>Lupinus bicolor</i>	Bicolored lupine	native, annual, uncommon, scattered throughout the site
<i>Lupinus excubitus</i> var. <i>excubitus</i>	Grape soda lupine	native, subshrub, uncommon, where lower end of site slopes southward
<i>Lupinus microcarpus</i> var. <i>microcarpus</i>	Chick lupine	native, annual, occasional, scattered throughout the site
<i>Prosopis glandulosa</i>	Honey mesquite	exotic, tree, occasional, planted with other trees
<i>Robinia psuedo-acacia</i>	Locust	exotic, tree, occasional, planted with other trees
<i>Trifolium hirtum</i> *	Rose clover	exotic, annual, occasional, scattered throughout the site
<i>Vicia americana</i>	American vetch	native, perennial, uncommon, on banks of dry drainage
FAGACEAE	Legume Family	
<i>Quercus douglasii</i>	Douglas oak	native, tree, common in foothills N of site
<i>Quercus lobata</i>	Valley oak	native, tree, rare, in wash-canyons north of site
GERANIACEAE	Geranium Family	
<i>Erodium botrys</i> *	filaree	exotic, annual, locally common off-site to north in terrace foothills
<i>Erodium cicutarium</i> *	Red-stem filaree	exotic, annual, abundant throughout the site
<i>Erodium macrophyllum</i>	Round-leaf filaree	native, annual, off-site 1000m N of project boundary in foothills N of the site
HYDROPHYLLACEAE	Water-leaf Family	
<i>Phacelia ciliata</i>	Valley phacelia	native, annual, rare on-site, scattered about flats, locally common in clay deposits of foothill terraces N of the site
LAMIACEAE	Geranium Family	
<i>Marrubium vulgare</i> *	Horehound	exotic, annual, occasional throughout the site, especially in drainages
<i>Salvia apiana</i> *	White sage	exotic, shrub, cultivated-hydroseed established on aqueduct berm at the southwest end of the project area
MALVACEAE	Mallow Family	
<i>Malva parviflora</i>	Cheese weed	exotic, annual, occasional throughout the site, especially in drainages, wet disturbed areas

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NYCTAGINACEAE	Four O'Clock Family	
<i>Mirabilis multiflora</i>	Giant four o'clock	native, perennial, uncommon, scattered throughout the site, mostly on banks of drainages
ONAGRACEAE	Evening Primrose Family	
<i>Epilobium ciliatum</i>	Willow herb	native, perennial, rare, N of site in wet drainages-seeps
PAPAVERACEAE	Poppy Family	
<i>Eschscholzia californica</i>	California poppy	native, annual, frequent, but not numerous, throughout the site, usually in the sandy soils
PLANTAGINACEAE	Plantain Family	
<i>Plantago erecta</i>	Plantatin	native, annual, occasional on terrace foothills N of site
PLANTANACEAE	Sycamore Family	
<i>Platanus racemosa</i>	Sycamore	native, tree, occasional in wash-canyons north of site
POLEMONIACEAE	Phlox Family	
<i>Gilia brecciarum ssp. brecciarum</i>	Gilia	native, annual, uncommon, in dry drainages
<i>Eriastrum sp.</i>	Wooly-star	native, annual, immature, uncommon, in dry drainages
<i>Linanthus liniflorus</i>	Linanthus	native, annual, uncommon, scattered throughout the site, probably more common in years of high rainfall
<i>Phlox gracilis</i>	Annual phlox	native, annual, uncommon, in dry drainages
POLYGONACEAE	Buckwheat Family	
<i>Eriogonum fasciculatum var. foliosum</i>	California buckwheat	native?, shrub, hydroseed established on aqueduct berm at the southwest end of the project area, perhaps native-adventive for some plants
<i>Eriogonum baileyi var. baileyi</i>	Bailey buckwheat	native, annual, uncommon, scattered along sloping south end
<i>Polygonum arenastrum*</i>	Knotweed	exotic, annual, in muddy wet areas
<i>Polygonum lapathifolium</i>	Willow-herb	native, annual, at cattle pond N of 28/33 section line
<i>Rumex crispus*</i>	Dock	exotic, uncommon, perennial seep in upper drainage
<i>Rumex salicifolius</i>	Willow dock	native, perennial, rare, one plant observed in upper dry drainage
SALICACEAE	Willow Family	
<i>Salix laevigata</i>	Red willow	native, tree, one tree in dry drainage
SOLANACEAE	Solanum Family	
<i>Datura wrightii</i>	Sacred datura	native, perennial, scattered in dry drainages mostly
SCROPHULARIACEAE	Figwort Family	
<i>Castilleja exserta ssp. exserta.</i>	Purple owl's clover	native, annual, , frequent, but not numerous, throughout the site
<i>Collinsia bartsiiifolia var. davidsonii</i>	Collinsia	native, annual, rare, on banks of dry drainages
<i>Mimulus guttatus</i>	Yellow monkeyflower	native, annual, frequent in seep of upper drainage
<i>Veronica anagallis-aquatica*</i>	Water speedwell	exotic, perennial, frequent in seep of upper drainage

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TAMARICACEAE	Tamarisk Family	
<i>Tamarix cf. ramosissima</i> *	Salt Cedar	exotic, tree, uncommon in the dry drainages
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ANGIOSPERMS - MONOCOTS		
CYPERARACEAE	Dodder Family	
<i>Carex praegracilis</i>	Clustered field sage	native, perennial, rare, north of site at cattle pond
<i>Eleocharis sp. (cf. macrostachya)</i>	spike-rush	native, perennial, frequent at seep in upper drainage, needs ID work, like macrostachya
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JUNCACEAE	Rush Family	
<i>Juncus balticus</i>	Wire rush	emergent perennial, frequent at seep in upper drainage, common in mesic drainages off-site
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LILIACEAE	Lily Family	
<i>Bloomeria crocea</i>	Bloomeria	native, geophyte, uncommon, in foothills north of site
<i>Dichelostemma capitatum ssp. capitatum</i>	Blue dicks	native, geophyte, uncommon, scattered around the flats, more common to the north of 28/33 section line
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POACEAE	Grass Family	
<i>Avena barbata</i> *	Wild oat	exotic, annual, frequent, but not numerous, throughout the site
<i>Avena fatua</i> *	Wild oat	exotic, annual, uncommon, N of site, in foothills
<i>Bromus diandrus</i> *	Ripgut	exotic, annual, uncommon, throughout the site
<i>Bromus hordeaceus</i> *	Hairy brome	native, perennial, occasional throughout the site
<i>Bromus madritensis ssp. rubens</i> *	Red brome	exotic, annual, abundant throughout the site
<i>Bromus tectorum</i> *	Cheatgrass	exotic, annual, abundant throughout the site
<i>Elymus elymoides</i>	Squirrel-tail	native, perennial, rare on-site, drainage banks, frequent to the north in the low foothills
<i>Hordeum murinum ssp. leporinum</i> *	Wild barley	exotic, annual, occasional, seep in upper drainage
<i>Leymus triticoides</i>	Creeping wildrye	native, perennial, rare in the project area, but frequent in mesic drainages and seeps north and west of the project area
<i>Nasella cernua</i>	Nodding needlegrass	native, perennial, occasional, scattered throughout the site, abundant to the north in the low foothills
<i>Poa secunda ssp. secunda</i>	One-sided bluegrass	native, perennial, occasional on banks of dry drainages
<i>Polypogon interruptus</i>	Ditch beard grass	native, perennial, at cattle pond N of 28/33 section line
<i>Polypogon monspeliensis</i> *	Rabbit's foot grass	exotic, annual, occasional at upper drainage seep
<i>Schismus barbatus</i> *	Split grass	exotic, annual, uncommon, scattered about in sandy openings
<i>Vulpia microstachys</i>	Annual fescue	native, annual, atypical forms, needs ID work, occasional, at the southern end
<i>Vulpia myuros</i>	Zorro	exotic, annual, distributed throughout the site, but not common, locally common further to the north

Scientific Name	Common Name	Comments
POTAMOGETONACEAE	Pondweed Family	
<i>Potamogeton sp.*</i>	Pondweed	perennial, at cattle pond N of 28/33 section line
TYPHACEAE	Cattail Family	
<i>Typha domingensis</i>	Southern cattail	native, emergent perennial, at pond of upper drainage seep